A Review Paper on Experimental and CFD Analysis of Gas Geyser

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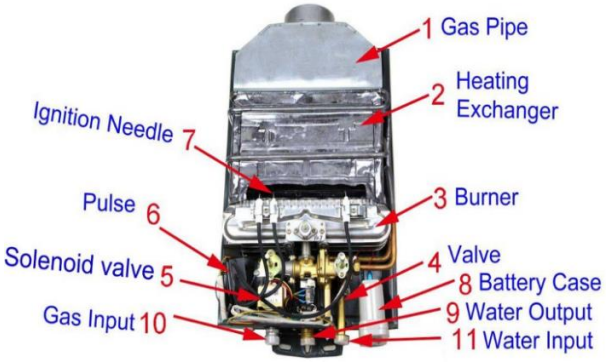
***Abstract*—This review paper summarizes the previous work on gas geyser coilarrangement to enhance the heat transfer rate, efficiency and heat transfer properties experimentally and by using CFD Fluent software. This research paper will help the researchers to find the encapsulation to enhance heat transfer in gas geyser with different coiling configuration and also give a good idea about the previous and resent research work on coiling arrangement. This Review paper shows comprehensive review and researches on different coil geometric parameters of the world.**

Keywords—Convection;Coiling configuration;Fluent; Efficiency.

III. INTRODUCTION

Energy demand is continuously increasing due to global population, growth and improved living standards. Water heating can be attributed as the second largest energy use in the homes and can account for nearly a quarter of overall household energy consumption thereforedifferent kinds of domestic hot-water heatersare exist. The operational cost and performance of these heatersare varies with input energy sources and heater design. Hence, the proper choice of a domestic heatercould save energy and reduce operational costs, significantly, hence in thisreview paperan attempt is made to know enhancement of heat transfer characteristics of gas geyser for different geometric variation of coiling like diameter of pipe, no. of turns of pipe, mass flow rate of water etc.



II. LITERATURE REVIEW

Heat transfer rate of twisted type shell and tube heat exchanger is greater as compared to different tube geometry namely circular, elliptical, and coil type. [1]

The helical tube heat exchanger is compared with the straight tube heat exchanger in both parallel and counter flow by varying parameters like temperature, flow rate of cold water and number of turns of helical coil an enhanced heat transfer is obtained in helical coil compared to that of straight pipe. The inside over all heat transfer coefficient for helical pipe is approximately 0.35 of straight pipes and the effectiveness of pipes in counter flow is greater than parallel flow configuration and hence helical heat exchangers are more efficient than normal straight heat exchangers.[2]

If the economizer was successfully installed on the gas geyser then it resulted in higher outlet temperature, as the amount of heat flow has increased by 28 %, because of better utilization of flue gases by economizer.[3]

Centrifugal forces created a high velocity region and acceleration forces acting on the fluid flow in the pipe create high pressure region at the outer side of the hollow helical pipe walls and increase in turbulence results in decrease of friction factor. [4]

Researchersfully analysed the boiler super heater tube leakage problem and find the causes of tube leakages with the help of CFD. The analysis mainly focused on finding out the super heater tube portion which to be affected by high flue gas temperature. The identified Super heater tube Portion to be shielded with SS plates. The Shield Plate will safe guard the super heater tube where the weak portion has been find out. Providing SS plate transfer the heat safe manner to Super heater tube. Due to thissuper heater tube leakage will be avoided and results in improved power production without any plant shutdown. [5]

An Experimentalstudy of helical coil induction water heater using Induction cooker is conducted by modifying, varying geometrical configurations and variations in water flow rate. It is found that when one helical coil is selected at different water flow rate, then the water outlet temperature decreases with increase in water flow rates. This paper also found that as number of turn's increases, the water outlet temperature is also increased at same water flow rate. [6]

The CFD predictions match reasonably well with the experimental results within experimental error limits. Based on the results a correlation was developed to calculate the inner heat transfer coefficient of the helical coil. [7]

The optimization of the coil is achieved by minimizing the pitch of the coil. [8]

If the velocity increases the ratio of pressure drop to heat removed is comparatively less for 60 mm coil pitch compared to the change in 30 mm coil pitch. The Nusselt number increases in direct proportion to the pressure drop at lower dean number and the profile is parabolic and the steepness decreases for higher dean numbers hence the heat transfer characteristics of a 60 mm coil pitch are better compared to a 30 mm coil pitch at higher Dean Number with limitation in space and more loss in pressure drop. [9]

The CFD results are closely validated by numerical correlation, and the heat transfer rate, heat transfer coefficient, Nusselt number and pressure drop is higher in case of helical coil compare to the straight tube. The pressure drop in helical coil varies linearly for small flow rate and varies exponentially for higher flow rate. [10]

CFD results are fairly matches with the experimental results and as the mass flow rate increases the heat transfer decreases and heat transfer increases as pitch decreases, means heat transfer is inversely changes with change in mass flow rate and pitch. [11]

Temperature drop and Pressure drop are affected by geometry of helical coil heat exchanger both for the constant wall temperature and constant wall heat flux boundary conditions. It was observed that the variation in tube diameter has greater influence on temperature drop and pressure drop. As the tube diameter goes on reducing the temperature drop increased along with loss of pressure, and temperature drop is maximum for lower flow rate and goes on reducing as the flow rate increases, whereas pressure drop is directly proportional to flow rate. [12]

III. CONCLUSION:

A review of various coil configuration of gas geyser for different geometric parameters is carried out, experimentally as well as analytically using CFD software. It is concluded from the review, the resent researchers focused on design and geometric parameters of heat exchanger coil to increase the heat transfer properties and optimum utilization of fuel.

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